

Assessment of phosphate wasting using TmP/GFR

The TmP/GFR is the ratio of the renal tubular maximum reabsorption rate of phosphate (TmP) to glomerular filtration rate (GFR).^{1,2}

The TmP/GFR is used to evaluate renal phosphate reabsorption.^{1,2} In patients with X-linked hypophosphataemia, elevated levels of fibroblast growth factor 23 (FGF23) decrease the TmP/GFR. Therefore, TmP/GFR is a useful biomarker for diagnosing XLH and for monitoring efficacy of treatment.³

You will need the following values to calculate the TmP/GFR. Please note that these should be fasting values.

Urine phosphate (mmol/L)	
Plasma phosphate (mmol/L)	
Urine creatinine (mmol/L)	
Plasma creatinine (mmol/L)	

Calculation

Step 1: Calculate the fractional tubular reabsorption of phosphate (TRP)

$$TRP = 1 - \left\{ \left(\frac{\text{urine phosphate}}{\text{plasma phosphate}} \right) \times \left(\frac{\text{plasma creatinine}}{\text{urine creatinine}} \right) \right\}$$

Step 2: Calculate the TmP/GFR (mmol/L) based on TRP value

If $TRP \leq 0.86$, $TmP/GFR = TRP \times \text{plasma phosphate}$

Or

If $TRP > 0.86$, $TmP/GFR = 0.3 \times \frac{TRP}{1 - (0.8 \times TRP)} \times \text{plasma phosphate}$

$TmP/GFR \text{ (mmol/L)} =$ _____

Interpretation

A low TmP/GFR value suggests renal phosphate wasting.

Available age-related reference ranges for TmP/GFR are given below.[†]

Reference ranges²

Age	Healthy range (mmol/L)
Birth	1.43–3.43
3 months	1.48–3.30
6 months	1.15–2.60
2–15 years	1.15–2.44
Female 25–35 years	0.96–1.44
Male 25–35 years	1.00–1.35
Female 45–55 years	0.88–1.42
Male 45–55 years	0.90–1.35
Female 65–75 years	0.80–1.35
Male 65–75 years	0.80–1.35

[†]Ranges not provided from 3 months to 6 months, 6 months to 2 years, 16–24 years, 36–44 years (male and female), 56–64 years (male and female) and 75+ years old.

1. Manghat P, et al. *Ann Clin Biochem.* 2014;51:631–56. 2. Payne RB. *Ann Clin Biochem.* 1998;35:201–6. 3. Saraff V, et al. *Paediatric Drugs* 2020;22:113–21.